PATENT SPECIFICATION

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Complete Specification Left: Feb. 28, 1939.

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PROVISIONAL SPECIFICATION

An Improved Method of Damping Panel Vibrations

We, PRESSED STEEL COMPANY LIMITED, a British Company, of Cowley, Oxford, Oxfordshire, and WILLIAM SWALLOW, a British Subject, of 18, Staunton Road, Headington, Oxford, Oxfordshire, do hereby declare the nature of this invention to be as follows:—

This invention relates to an improved method of damping panel vibrations and whilst it is applicable particularly to the damping of panels in sheet metal structures such as vehicle bodies, it is not limited thereto, but has equal applicability to all panels prone to vibration.

It is frequently found that component parts of panel structures respond to the vibrations of other parts or adjacent members with the result that undesired noises are set up.

For example, the panels of a metal car body may be caused to vibrate audibly as a result of imperfections in the balance of the engine, vibration of the undercarriage due to road shocks and so on.

Various attempts have been made in the past with a view of overcoming this objection, such as the application of vibration damping materials of various kinds to those panels the vibration of which it is desired to prevent.

According to this invention an improved method of damping panel vibrations is achieved by attaching an energy absorbing medium to said panel, the exposed surface of said medium being under restraint, or substantially inextensible. Preferably a layer of a material having substantial internal friction or energy absorbing properties is attached to the body or panel prone to vibration and a further layer of a material offering substantial resistance to extension (or contraction) is attached to the surface of said layer of energy absorbing material whereby the body is effectively damped.

As examples of suitable energy absorbing materials suitable for use in the first applied layer may be mentioned rubber, rubber solution, felt, tar and asphalt, but many other elastic or plastic materials may also be used.

The outer substantially non-extensible layer may comprise strips or sheets of metal, perforated metal or wire netting, paper, leather cloth, synthetic resins, wood veneer and many other non-extensible materials.

It will readily be seen that if a thin strip of rubber is caused to adhere to a metal panel of a vehicle body and a strip of metal is caused to adhere to the outer surface of the rubber strip, should the metal panel be deformed from its normal formation as is necessary when vibrating, the strip of rubber will as a result of the non-extensibility of the metal covering strip, be subjected throughout its whole length to shear stress. The production of shear stress in the material in this manner results in a very effective damping of the panel.

When the materials are used in strip form they may be arranged to lie in various directions upon the panel according to the mode of vibration to be dealt with.

Dated this 29th day of March, 1938.

T. M. CONNELLY,
Chartered Patent Agent,
Agent for the Applicants.

COMPLETE SPECIFICATION

An Improved Method of Damping Panel Vibrations

We, PRESSED STEEL COMPANY LIMITED, a British Company, of Cowley, Oxford, Oxfordshire, and WILLIAM SWALLOW, a British Subject, of 18, Staunton Road, Headington, Oxford, Oxfordshire, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to an improved method of damping panel vibrations and whilst it is applicable particularly to the damping of panels in sheet metal struc-

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tures such as vehicle bodies, it is not limited thereto, but has equal applicability to all panels prone to vibration

It is frequently found that component parts of panel structures respond to the vibrations of other parts or adjacent members with the result that undesired noises are set up.

For example, the panels of a metal car body may be caused to vibrate audibly as a result of imperfections in the balance of the engine, vibration of the undercarriage due to road shocks and so on.

Various methods have been proposed in the past with a view to overcoming this objection, such as the application of vibration damping materials of various kinds to the panels. Weighting of the panels, or stiffening thereof, by the application of material such as cardboard thereto, or by the formation of swages or reinforcing ribs therein, have also been tried with a view to changing the periodicity of the panel so as not to coincide for example with any of those of a slightly unbalanced engine.

One arrangement is disclosed in the prior specification No. 456,235 wherein a substantially non-resonant panel structure is provided consisting of two panels of equal extent secured together over their entire contiguous areas by an adhesive or sound-deadening compound. Such a panel is intended primarily for the sliding roof panels of vehicles, and has the further feature that the inner panel is formed with integral reinforcements which serve also for the attachment of accessories.

A further proposal for the damping of vibrations in the various metal panels of vehicle bodies contemplates the provision of a sheet of relatively stiff material, e.g. cardboard, overlying a portion of one face of the panel, and a layer of plastic material, e.g. an asphaltic cement, interposed between, and in contact with, the panel and the sheet of stiff material, whereby vibrations arising in the panel will produce relative movement between the panel and the sheet to deform the layer of plastic material and dissipate the energy of the vibrations.

The improved method of damping panel vibrations according to the invention consists in attaching a narrow strip or strips of a material having substantially internal friction to the panel with the surface of each of said applied strips away from the panel and held under restraint.

By " held under restraint " is meant that the surface of the energy absorbing material is wholly or substantially incapable of extension or contraction.

According to the preferred method of carrying out the invention a narrow strip of a material having substantial internal friction or energy absorbing properties is made to adhere to the surface of the panel and a further narrow strip of a material offering substantial resistance to extension or contraction is made to adhere to the exposed surface of the first applied layer.

Alternatively a narrow strip of suitable material having substantial internal friction may be applied to the surface of the panel as before and the exposed surface thereafter treated to produce a substantially non-extensible or non-contractible skin of appropriate thickness, or the said skin may be produced before the application of the energy absorbing material to the panel.

The invention is illustrated by way of example in the accompanying drawings in which

Figs. 1 and 2 are views in section of a part of a panel treated by the method according to the present invention to prevent vibration,

Fig. 3 illustrates the invention as applied to a panel of a door of a road vehicle for example,

In Fig. 1 A represents a part of a panel of metal or other material prone to vibration. B is a narrow strip of a material such as rubber having high internal friction or energy absorbing properties made to adhere to this panel A. C represents a strip of relatively thin and preferably flexible material such as thin sheet metal which under normal conditions is incapable of substantial extension or contraction, made to adhere to the surface of the rubber or other strip B.

For the sake of explanation the parts A, B, C are shown as all being of the same length in both Figs. 1 and 2.

Vibrations of the panel A which create noise result in the panel bending alternately in opposite directions.

Fig. 2 shows an exaggerated bend in one direction to illustrate the relative movement between panel A and non-extensible strip C and the effect upon the strip of energy absorbing material B. The relative movement between A and C is represented as all taking place at one end, see dimension D, and it will be readily appreciated that this relative movement will be resisted by shear stresses produced in and distributed over substantially the whole body of the intermediate strip B.

The use, for strip B, of rubber which is a material having high mechanical hysteresis, results in rapid absorption of the energy of vibration and consequent rapid damping.

In Fig. 3 the damping of a door panel

A is carried out by the application of two spaced transverse narrow strips of energy absorbing material B to the panel and two outer thin metal strips C.

The number, dimensions and arrangement of the strips B and C will of course vary with such factors as the size of the panel to be damped and the mode of vibration to be dealt with.

As examples of energy absorbing materials other than rubber referred to above for use in carrying out the invention, may be mentioned rubber solution, felt, tar and asphalt, but many other elastic or plastic materials having the essential energy absorbing property may be used.

The outer restraining strip or strips may be of thin sheet metal as in the above described examples or of metal foil, perforated metal, wire netting, paper, leather, various kinds of non-extensible cloth, synthetic resins, wood veneer and many other non-extensible materials.

Adhesion between a layer of energy absorbing material and the panel on the one hand and the restraining material on the other may be achieved in any well-known way.

Using a strip of rubber between a metal panel and a metal retraining strip for example, a petroleum base rubber solution may be employed.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A method of damping panel vibrations consisting in attaching a narrow strip or strips of a material having substantal internal friction to the panel with the surface or surfaces of said applied strip or strips away from the panel held under restraint.

2. A method of damping panel vibrations according to claim 1 consisting in attaching a narrow strip or strips of substantially non-extensible and non-contractible material to the surface or surfaces of the first mentioned strip or strips away from the panel.

3. A modification of the method of damping panel vibrations according to claim 2 wherein the strip or strips of substantially non-extensible and non-contractible material is or are attached to one surface of the strip or strips of material having substantial internal friction before the latter is or are attached to the panel.

4. A method of damping panel vibrations according to claim 1, wherein one surface of the strip or strips of material having substantial internal friction is or are treated to form a substantially non-extensible and non-contractible skin either before or after said strip or strips is or are attached to the panel.

5. Means for use in damping vibrations of a vibration-prone panel, comprising a narrow strip or strips of material having substantial internal friction so as to be capable of energy absorption, adapted to be attached to the panel to be damped, the face or faces of the strip or strips opposite that or those to be attached to the panel being held under restraint.

6. Means as claimed in Claim 5 comprising a narrow strip of rubber to one surface of which is attached a relatively thin strip of non-extensible and non-contractible material.

7. Means as claimed in Claim 6 wherein the non-extensible and non-contractible material is formed by a strip of relatively thin sheet metal or metal foil.

Dated this 28th day of February, 1939.

T. M. CONNELLY,
Chartered Patent Agent,
Agent for the Applicants.

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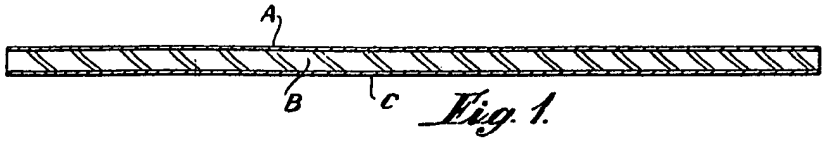

Fig. 1.

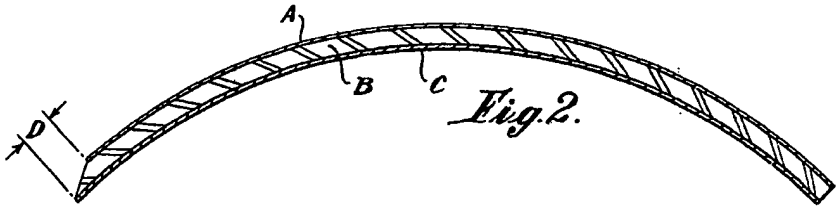

Fig. 2.

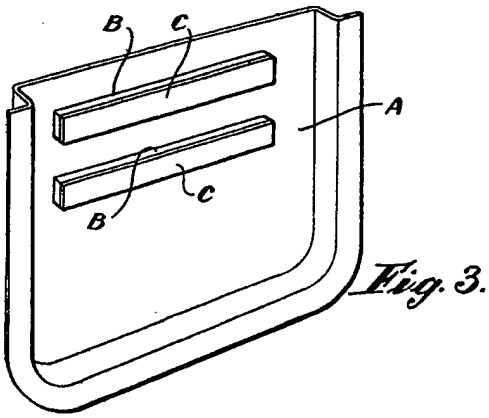

Fig. 3.

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